

## PATENT COOPERATION TREATY


( 2 9. 09. 06 )

## PCT

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 39659WOP00	<b>FOR FURTHER ACTION</b>		See Form PCT/PEA/416
International application No. PCT/IB2005/051007	International filing date (day/month/year) 24.03.2005	Priority date (day/month/year) 26.03.2004	
International Patent Classification (IPC) or national classification and IPC INV. C02F1/44			
Applicant U.S. FILTER WASTEWATER GROUP, INC. et al.			
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 7 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau) a total of 6 sheets, as follows:</p> <p><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box. Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>			
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the report</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input checked="" type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input checked="" type="checkbox"/> Box No. VIII Certain observations on the international application</p>			
Date of submission of the demand  20.01.2006		Date of completion of this report  28.09.2006	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465		Authorized officer  Grigoraki, Erasmia  Telephone No. +49 89 2399-8353	



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**Box No. I Basis of the report**

1. With regard to the **language**, this report is based on

- ☒ the international application in the language in which it was filed
- ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3(a) and 23.1(b))
  - ☐ publication of the international application (under Rule 12.4(a))
  - ☐ international preliminary examination (under Rules 55.2(a) and/or 55.3(a))

2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

**Description, Pages**

1-11 as originally filed

**Claims, Numbers**

1-33 received on 13.02.2006 with letter of 20.01.2006

**Drawings, Sheets**

1/1 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

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**Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

- ☐ the entire international application,  
☒ claims Nos. 20-22

because:

- ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):
- ☒ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. 20-22 are so unclear that no meaningful opinion could be formed (*specify*):  
**see separate sheet**
- ☐ the claims; or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed (*specify*).
- ☐ no international search report has been established for the said claims Nos.
- ☐ a meaningful opinion could not be formed without the sequence listing; the applicant did not, within the prescribed time limit:
- ☐ furnish a sequence listing on paper complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Preliminary Examining Authority in a form and manner acceptable to it.
- ☐ furnish a sequence listing in electronic form complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Preliminary Examining Authority in a form and manner acceptable to it.
- ☐ pay the required late furnishing fee for the furnishing of a sequence listing in response to an invitation under Rules 13~~ter~~.1(a) or (b) and 13~~ter~~.2.
- ☐ a meaningful opinion could not be formed without the tables related to the sequence listings; the applicant did not, within the prescribed time limit, furnish such tables in electronic form complying with the technical requirements provided for in Annex C-*bis* of the Administrative Instructions, and such tables were not available to the International Preliminary Examining Authority in a form and manner acceptable to it.
- ☐ the tables related to the nucleotide and/or amino acid sequence listing, if in electronic form only, do not comply with the technical requirements provided for in Annex C-*bis* of the Administrative Instructions.
- ☐ See separate sheet for further details

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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**1. Statement**

Novelty (N)	Yes: Claims	2-4,11-19,23,26,28-33
	No: Claims	1,5-10,24,25,27
Inventive step (IS)	Yes: Claims	
	No: Claims	2-4,11-19,23,26,28-33
Industrial applicability (IA)	Yes: Claims	1-33
	No: Claims	

**2. Citations and explanations (Rule 70.7):**

**see separate sheet**

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**Box No. VIII Certain observations on the international application**

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The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

**see separate sheet**

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**Conc. Item III:**

Claims 20-22 do not fulfill the requirements of Article 6 PCT since they attempt to define the subject matter in terms of the result to be achieved without providing the technical features necessary for achieving this result and/or contain no well defined parameters/terms. The scope of protection therefore cannot be determined in a clear and precise manner.

For these claims no meaningful opinion as to novelty /inventive step can be thus given.

**Conc. Item V:**

Reference is made to the following document which has been also cited in the application:

D1: US-A-6 120 688

**Novelty:**

D1 discloses a method of purifying impure water containing filterable and dissolved impurities by using a microfiltration (MF) unit and afterwards a 1st reverse osmosis (RO) unit (cf fig. 1; no 10, 70). From said 1st RO unit 70 the retentate 82 which can be regarded also as the residual RO stream (from the 1st RO) is fed to a 2nd RO unit/filter 86 where it is treated again before it is reused to backwash the MF unit via Tank 100. The water permeate from the 1st RO unit 70 is fed to storage tank 80 which is the same as for the permeate from the 2nd RO which is said to be potable water (cf D1: col. 6, l. 37-60, 66-67). The examining Authority is therefore of the opinion that the method of present claim 1 is still open to an objection of lack of novelty under Article 33(2) PCT in view of D1.

D1 discloses evidently also an apparatus comprising a primary MF, a RO unit downstream to MF, a controllable fluid pathway as well as means for treating the residual RO stream prior to reuse as defined in present claim 24 which is the same as the original claim 26 (cf D1: col. 3, l. 49 to col. 7, l. 15). Novelty of the subject matter of claim 26 is therefore also objected under Art. 33(2) PCT.

The same objection of novelty under Art. 33(2) PCT applies to claims 5-10, 25 and 27 in view of the disclosure of D1 (cf col. 3, l. 34-42; col. 3, l. 49-66; col. 6, l. 22-col. 7, l. 15; col. 7, l. 55-col. 8, l. 27).

Inventive step:

Method claim 19 specifies additionally to claim 1 that the residual RO stream is treated by a 2ndary UF or MF prior to the step of backwashing the 1st MF/UF. This feature can establish novelty over the disclosure of D1.

As the technical problem vis-à-vis said D1 can be regarded to improve the quality of the reused retentate (=residual RO stream) in order to avoid the risk of introducing scale or biological material to the clean side of the MF/UF membrane.

The applicant should be aware of the fact that the technical problem of improving the quality of water /concentrate streams is per se not inventive. The solution to this problem i.e the selection of an appropriate method for treating such a water to be reused is a matter of common skill and does not necessarily require the exercise of an inventive step.

This is even shown on page 4, l. 13-20 or page 6, l. 18-page 7, l. 2, where other alternative solutions are cited for the purpose of cleaning/treating said retentate.

The examining Authority could not see any unexpected technical effect achieved hereby either.

The method of claim 19 would therefore lack an inventive step as required by Art. 33(3) PCT.

With the same reasoning as above the subject matter of each one of claims 2-4, 11-18, and 23, unless otherwise evidenced, is considered obvious and thus lacking an inventive step within the meaning of Art. 33(3) PCT.

**Conc. Item VIII:**

Present set of claims lacks conciseness/clarity and as such does not meet the requirements of Article 6 PCT. This for the following reasons:

Present set contains 2 independent claims for the method. Upon careful consideration of them it has been noted that in fact claim 19 contains essentially the features of claim 1 with the additional feature as defined in present claim 2 i.e it could be formulated as a dependent claim.

In fact the scope of protection in accordance with claim 19 is essentially the same as the

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one defined in claim 15 i.e is superfluous as an unnecessary repetition.

Present claim 29 is the combination of claims 24 and 25. This is superfluous since claim 25 already refers back to claim 24.

Claims 25,26 are such that the wording thereof corresponds moreover to a process. This can be easily overcome by employing the expression "means for".

Claim 28 relates clearly to process features and not to apparatus parts and as such is equally objected for lack of clarity.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A method of purifying impure water contaminated with a filterable impurity and a dissolved impurity, the method comprising the steps of:  
providing impure water to a primary microfiltration or ultrafiltration unit to remove the filterable impurity and produce impure filtered water contaminated with a dissolved impurity;  
providing the impure filtered water contaminated with a dissolved impurity to a reverse osmosis unit to produce a potable water stream and a residual reverse osmosis stream; and  
treating the residual reverse osmosis stream by being passed through a secondary filter prior to reuse to backwash the microfiltration or ultrafiltration unit.
2. A method according to claim 1 wherein the secondary filter is a microfiltration or ultrafiltration membrane.
3. A method according to claim 1 wherein the secondary filter is a cartridge filter.
4. A method according to claim 2 or claim 3 wherein the secondary filter is backwashed.
5. A method according to any one of the preceding claims wherein the impure water is sea water.
6. A method according to any one of the preceding claims wherein the insoluble impurities include those typically found in sea water.

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7. A method according to any one of the preceding claims wherein the insoluble impurities include organic matter, inorganic matter, particulate matter, biological matter and non-biological matter.
8. A method according to any one of the preceding claims wherein the dissolved impurities include dissolved, soluble or solubilized organic or inorganic matter.
9. A method according to any one of the preceding claims wherein the dissolved impurities include sodium ions and chloride ions.
10. A method according to any one of the preceding claims wherein the residual reverse osmosis stream is treated prior to being reused by one or more of chemical treatment, radiation treatment or physical treatment.
11. A method according to claim 6 wherein the chemical treatment is chlorination, fluorination, disinfection, scale control treatment, water softening, peroxide, sulfite/bisulfite, ozone or mixtures thereof.
12. A method according to claim 6 wherein the radiation treatment is UV, IR, microwave or mixtures thereof.
13. A method according to claim 6 wherein the physical treatment is ultrasonication or vortexing,

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14. A method according to any one of the preceding claims wherein the reverse osmosis stream is treated by heat, electroprecipitation, magnetic treatments or combinations thereof.

15. A method according to any one of the preceding claims wherein the residual reverse osmosis feed is used to backwash the primary microfiltration or ultrafiltration unit and is subject to ultrafiltration or microfiltration by a secondary ultrafiltration or microfiltration unit prior to said backwashing.

16. A method according to any one of the preceding claims wherein the secondary filter comprises multiple stages of filtration.

17. A method according to claim 16 wherein the multiple stages of filtration include a first filtration through a coarse filter prior to filtration through a membrane filter.

18. A method according to claim 17 wherein the reverse osmosis reject is in controllable fluid communication with coarse backwashable filters such as single or multimedia filters, disc filters, diatomaceous earth filters, membrane filters, strainers, or screens.

19. A method of purifying impure water, the method comprising the steps of providing a primary microfiltration unit, a reverse osmosis unit, said reverse osmosis in downstream fluid communication from said primary microfiltration or ultrafiltration unit, and a controllable fluid pathway for directing residual reverse osmosis feed to backwash said microfiltration unit and wherein the residual reverse osmosis feed is further subjected to ultrafiltration or microfiltration by a secondary ultrafiltration or microfiltration unit prior to a step of backwashing the primary ultrafiltration or microfiltration membrane.

20. A method according to any one of the preceding claims wherein the reverse osmosis reject used to backwash the filter has a suspended solids content of less than a predetermined quantity.
21. A method according to any one of the preceding claims wherein the reverse osmosis reject used to backwash the filter has a suspended solids content sufficient to allow it to be returned to the impure water source.
22. A method according to claim 20 or 21 wherein the reverse osmosis reject used to backwash the filter has a suspended solids content sufficient to allow it to be returned to the ocean.
23. A method according to any one claims 20 to 22 wherein the suspended solids content is controlled by controlling desalination recovery rate.
24. Apparatus for purifying impure water contaminated with a filterable impurity and a dissolved impurity, the apparatus comprising:  
a primary microfiltration or ultrafiltration unit to remove the filterable impurity;  
a reverse osmosis unit to produce a potable water stream and a residual reverse osmosis stream;  
said reverse osmosis in downstream fluid communication from said primary microfiltration or ultrafiltration unit;  
a controllable fluid pathway to transfer impure filtered water contaminated with a dissolved impurity from the primary microfiltration or ultrafiltration unit to the reverse osmosis unit; and  
means for treating the residual reverse osmosis stream prior to reuse.

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25. Apparatus according to claim 24 wherein the residual reverse osmosis stream is directed by a controllable fluid pathway to backwash the primary microfiltration or ultrafiltration unit.

26. Apparatus according to claim 24 or 25 wherein the residual reverse osmosis stream is directed by a controllable fluid pathway through a secondary microfiltration or ultrafiltration membrane to backwash the primary microfiltration or ultrafiltration unit.

27. Apparatus according to any one of claims 24 to 26 further including one or any combination of ports for the introduction of chemical agents, irradiation means, ultrasonic generators, vortexing devices, heating elements, electroprecipitators and magnets.

28. Apparatus according to any one of claims 24 to 27 wherein the chemical agents are chlorination agents, fluorination agents, ozonation agents, disinfecting agents, scale control treatment agents, water softening agents, peroxide, sulfite/bisulfite.

29. Apparatus according to any one of claims 24 to 28 for purifying impure water contaminated with a filterable impurity and a dissolved impurity, the apparatus comprising:  
a primary microfiltration or ultrafiltration unit to remove the filterable impurity;  
a reverse osmosis unit to produce a potable water stream and a residual reverse osmosis stream;  
said reverse osmosis unit in downstream fluid communication from said primary microfiltration or ultrafiltration unit;  
a controllable fluid pathway to transfer impure filtered water comprising a dissolved impurity from the primary microfiltration or ultrafiltration unit to the reverse osmosis unit; and

a conduit to transfer a residual reverse osmosis stream from the reverse osmosis unit to backwash the primary microfiltration or ultrafiltration unit via a secondary microfiltration or ultrafiltration unit.

30. Apparatus according to any one of claims 24 to 29 wherein the secondary microfiltration or ultrafiltration unit is a backwashable or disposable cartridge microfiltration or ultrafiltration system

31. Apparatus according to any one of claims 24 to 30 wherein the secondary microfiltration or ultrafiltration unit comprises multiple stages of filtration.

32. Apparatus according to claim 31 wherein the multiple stages of filtration include a first filtration through a coarse filter prior to filtration through a membrane filter.

33. Apparatus according to any one of claims 24 to 32 wherein the reverse osmosis reject is in controllable fluid communication with coarse backwashable filters such as single or multimedia filters, disc filters, diatomaceous earth filters, membrane filters, strainers, or screens.